EXHIBIT K

Effect of Merger on Market Price and Product Quality: American and US Airways

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Abstract

In this paper, I analyze the effect of the merger between American Airlines (AA) and US Airways (US) on market price and product quality. I use difference-in-differences analysis (DID) as the identification strategy. The DID analysis shows that the price has decreased and that the decrease in price is larger in bigger city-pair markets. Smaller city-pair markets have not benefited from reduction in price. Price has increased in the smaller markets due to the merger. Slot divestiture also has been helpful in reducing the price. The DID analysis also shows that the merger has no significant effect on the frequency of flights or on the number of seats. Delay in arrival and delay in departure have increased, while the merger has a significant effect in reducing the number of canceled flights.

Keywords Merger · Efficiency · Market power · Product quality

JEL Classification L1 · L4 · L9

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1 Introduction

According to the United States Department of Justice's (DOJ) updated 2010 merger guidelines, "mergers should not be permitted to create, enhance or entrench market power or to facilitate its exercise".[1] A merger can decrease competition by reducing the number of firms in the market. In the case of the 2013 merger between American Airlines (AA) and US Airways (US), the DOJ—along with seven states and the District of Columbia—decided to challenge the merger because of anti-competitive concerns.

AA and US Airways argued that the merger would generate substantial efficiencies, in terms of cost savings and consumer network benefits. The following quote is from the chief executive officer (CEO) of US Airways defending the merger:

> This merger will greatly enhance competition and provide immense benefits to the traveling public. Combined, US Airways and American Airlines will offer more and better travel options for passengers through an improved domestic and international network, something that neither carrier could provide on its own. Millions more passengers each year will fly on this new network than would fly on US Airways and American, should they be forced to remain separate. Conservative estimates place the net benefits to consumers at more than $500 million annually. Simply put, from the perspective of consumers, the new American will be much greater than the sum of its parts. This merger will be pro-competitive and lawful. Plaintiffs' request for this Court to enjoin the merger should be summarily denied.[2]

Since the U.S. airline industry has only a few large competitors, this merger raises the issue of increased market power for the existing airlines. But an increase in market power may not be always welfare-reducing for society as a whole. Even though an increase in market power and the resulting increase in price is not desirable from the point of view of consumers' welfare, Williamson (1968) shows that there is a tradeoff between efficiency gain and market power effect as is shown in Fig. 1.

According to Williamson (1968), a market power effect is necessary but not sufficient for a merger to reduce welfare. Accordingly in Fig. 1, AC_1 is the average cost and P_1 is the price in the pre-merger period. Average cost decreases to AC_2 in the post-merger period, but price increases to P_2. The area A_1 represents the deadweight loss, while the area A_2 represents the cost savings. If the area of A_2 is larger than the area of A_1 then the merger will be welfare-improving even though there is an increase in price. Farrell and Shapiro (2001) provides more detailed discussion about a consumer-welfare standard versus a total-welfare standard for the evaluation of mergers.

There is a debate about the efficiency gain and market power effects of mergers that involve airlines. The efficiency gain may be generated from cost savings in

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[1] https://www.justice.gov/atr/horizontal-merger-guidelines-08192010#5c.
[2] https://www.dallasnews.com/business/airlines/2013/09/10/heres-us-airways-defense-of-its-merger-with-american-airlines.
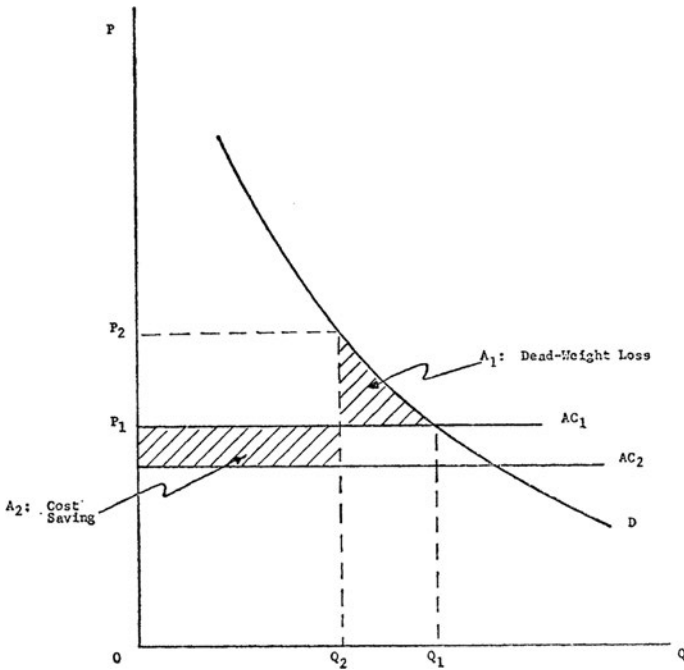
Fig. 1 Cost savings versus market power

airport operations, information technology, and supply chain management. Synergy is the concept that the performance of two companies that are combined will be greater than the sum of the performances of the separate individual companies. It can occur due to cost reductions, economies of scale, combined human resources, or technology.

Market power may be generated due to a reduction in the number of competitors in the market. As a result of the removal of a competitor, a firm might be able profitably to raise the market price of a good or service.

There is anecdotal evidence—for example, in media reports—that service quality decreases after a merger. Similar to price, there are two opposite effects on product quality: a positive effect that is due to a larger resource pool[3] and negative effects that are due to problems of integration. Service quality can improve because of the combined resource pool of the merged airline. The merged airline can improve quality by efficiently managing a larger resource pool.[4] For example, if there is a technical problem in the aircraft, a firm with a larger number of aircrafts can deploy a substitute aircraft and reduce delays in departure. A larger airline can also internalize

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[3] See Robinson (1958) for a more detailed discussion of sources of economies of scale.

[4] However, the same improvement in quality or cost savings can be achieved through the internal growth of an airline, and this improvement is not merger-specific as is described in the Horizontal Merger Guidelines by the DOJ.

congestion externalities.[5] The merged airline can upgrade quality by adopting the best practices of the two airlines.

Quality of service can decrease due to the problems in integrating important resources. Problems can occur in combining the labor forces and merging the reservation systems of the two airlines. Reduced competition in the post-merger period may also decrease quality.

A post-merger empirical analysis can help determine whether efficiency or market power dominates by analyzing the price before and after the merger (Hosken et al. 2017). Also, a change in the quality of service can be analyzed by looking at the change in flight frequency and other observable data, such as delays and cancellation of flights.

While there are many studies that analyze the effect of mergers on market price, there are only a few studies that analyze the effect on product quality. This paper analyzes the effect of the merger on product quality in addition to analyzing the effect on price.

The merger between AA and US is quite special in many respects: First, these two airlines together were going to create the largest airline in the world when the merger was proposed in 2012. Second, AA was undergoing bankruptcy during that time. Last, these two airlines had 30% overlapping[6] routes among their city-pair markets. It is an important merger to study because of these three unique factors.

I use difference-in-differences analysis as the main identification strategy. I find that the merger has a significant negative effect on price and that the effect is larger for bigger markets. The effect on price in smaller markets is the opposite of that in larger markets, which implies that the smaller city-pair markets have not benefited from the merger. I also find that the merger had no significant impact on the frequency of flights or on the number of seats. However, delays in departure and delays in arrival have increased in the post-merger period. But the merger has reduced the number of canceled flights.

Section 2 of this paper briefly describes the related literature. Section 3 covers the history of the U.S. airline industry. Section 4 provides a brief background of the merger. Section 5 describes the data and the variables. Section 6 outlines the identification strategy. Section 7 describes the results. Section 8 concludes.

2 Literature Review

There may be a tradeoff between efficiency gain and market power in the case of a merger between two firms. Williamson (1968) analyzed this tradeoff and concluded that antitrust authorities should consider both sides before deciding to approve or reject a merger. If the efficiency gain (when embodied in a reduction in marginal

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[5] Congestion externalities are created when airlines do not consider that adding flights may lead to increased delays for other air carriers. See Mayer and Sinai (2003) for more details.

[6] The route networks of AA, US, and the overlapping markets are shown in "Appendix".

costs) dominates the market-power effect, then the price will decrease; otherwise, the price will increase.[7]

After the airline industry deregulation in 1978 many mergers took place. Carlton et al. (1980) studied the merger between North Central Airlines and Southern Airways and did not find any significant increase in price. Borenstein (1990) analyzed two mergers: the Northwest (NW) merger with Republic Airlines (RP); and Trans World Airlines' (TWA) purchase of Ozark (OZ). He showed that the combined airlines gained airport dominance, which resulted in substantial market power. Werden et al. (1991) examined the same two mergers and found a considerable increase in price and a reduction in service. Morrison (1996) studied NW-RP, TWA-OZ and Piedmont (PI)-US Airways (US). He found that the price increases were 2.5% for NW-RP, 15.3% for TWA-OZ, and 23% for PI-US.

Kim and Singal (1993) studied airline mergers between 1985–1988 and showed that the effect of efficiency gain on costs was more than offset by the exercise of increased market power. Evans and Kessides (1993) found a positive correlation between route concentration and price. They also found a positive correlation between airport concentration and price.[8]

There are a few studies that have used merger simulation techniques to predict the post-merger price. Peters (2006) used merger simulation to predict the post-merger prices for five mergers that took place in the 1980s and then made a comparison between predicted post-merger prices and actual post-merger prices. He concluded that deviations from the assumed model of firm conduct play an important role in understanding the observed difference between the predicted and actual post-merger prices.

Kwoka and Shumilkina (2010) analyzed the US-Air and Piedmont merger and showed that the combined firm achieved pricing power on many routes after merging with a potential competitor. Bilotkach (2011) analyzed the relationship between multi-market contact (MMC) and intensity of competition. The paper showed that high MMC (due to a merger) resulted in a reduction of the frequency of flights. Many papers have analyzed the effects of mergers on market price (Luo 2014). Most of the studies found an increase in price except, few studies that found no effect on price.

For bank mergers, Sapienza (2002) found that for small target firms the lending rate decreased but for large target firms the rate increased. Prager and Hannan (1998) found that banks reduce their deposit rates after merger. Kahn et al. (2005) found that the lending rate for individual loans increased but for automobile loans the rate did not increase much. Focarelli and Panetta (2003) investigated the long-run price effects of mergers and found that consolidation did generate temporary adverse price changes. In the long run, efficiency gains dominated over the market power effect, leading to more favorable prices for consumers.

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[7] Farrell and Shapiro (1990) analyzed the general conditions under which horizontal mergers raise prices.

[8] Other studies that analyzed the relationship between concentration and market power in the airline industry include Borenstein (1989) and Abramowitz and Brown (1993).

For hospital mergers Dafny (2009), Krishnan (2001), and Capps and Dranove (2004) found that the prices increased after a merger.

Mazzeo (2003), Rupp and Holmes (2006), Rupp et al. (2006), and Prince and Simon (2009) found that there is a positive relationship between quality and competition. In the case of the hospital industry, Vogt and Town (2006) found mixed evidence of quality change in different mergers. Ho and Hamilton (2000) found that mergers affected the quality negatively in many cases. In the case of the airline industry, Chen and Gayle (2018) measured quality as the ratio of nonstop flight distance to itinerary flight distance and found that quality improved after merger.

This paper fills the gap in the literature by analyzing the effects of this particular merger on price and product quality. Since there are very few empirical studies that analyze the aspect of product quality this paper contributes to understanding the effects on both price and product quality that were due to the AA-US merger.

3 US Airline Industry

The Civil Aeronautics Board (CAB) was established in 1938.[9] It directly regulated the airline industry by controlling prices, entry, exit, and merger. In 1958, Federal Aviation Agency (subsequently renamed the Federal Aviation Administration, or FAA) assumed responsibility from the Civil Aeronautics Authority for providing for the safe and efficient use of national airspace.[10]

In the 1970s the CAB was discredited for not being able to deliver a good market performance. The Airline Deregulation Act of 1978 was aimed at bringing competitiveness to the commercial aviation industry and removing government regulation without reducing the powers of FAA over all aspects of air safety. After deregulation,[11] prices decreased by 30% in inflation-adjusted terms. The airline industry faced many challenges during the 1980s, and a large number of mergers took place in the industry.

After the attack on 11th September 2001, the airline industry faced additional challenges: these included weak demand and fuel price volatility. Both the legacy airlines and the low-cost carriers (LCCs) have responded to these challenges by bankruptcies, reorganizations, spin-offs, and new pricing strategies. There have been seven major mergers in recent years: US Airways and America West Airlines (2005), Delta Air Lines and Northwest Airlines (2008), Republic Airlines and Midwest Airlines (2009), Republic Airlines and Frontier Airlines (2009), United Airlines and Continental Airlines (2010), Southwest Airlines and AirTran Airways (2011), and American Airlines and US Airways (2013).

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[9] Borenstein and Rose (2014) gave a very detailed overview of the U.S. passenger airline industry.

[10] https://www.faa.gov/about/history/brief_history/.

[11] For a detailed review of deregulation in the U.S. see Winston (1993, 1998).

4 The AA-US Merger Background

On November 29, 2011, American Airlines filed for bankruptcy. In April 2012 US airways announced that it intended to take over American Airlines. In February 2013, American Airlines and US Airways announced plans to merge, creating the largest airline in the world.

On August 13, 2013, the United States Department of Justice, along with Attorneys General from the District of Columbia, Arizona (Headquarters of US Airways), Florida, Pennsylvania, Tennessee, Texas (Headquarters of American Airlines), and Virginia filed a lawsuit to block the merger, arguing that it would result in less competition and higher prices. American Airlines and US Airways both announced their intention to fight the lawsuit and defend their merger.

The Department of Justice reached a settlement of its lawsuit on November 12, 2013: The settlement required the merged airline to give up landing slots or gates at seven major airports. Under the deal, the new American was required to sell 104 take-off and landing slots at Ronald Reagan Washington National Airport and 34 slots at LaGuardia Airport. Additionally, AA had to sell two gates at O'Hare International Airport, Los Angeles International Airport, Logan International Airport, Dallas Love Field, and Miami International Airport. Some of the slots were sold to low-cost carriers such as JetBlue and Southwest Airlines.[12]

An appeal filed in the US Supreme Court against the merger complaining about price increases was declined by the Supreme Court on December 8, 2013.[13] On this day American Airlines emerged from bankruptcy as AMR Group. On April 8, 2015, the Federal Aviation Administration awarded American Airlines and US Airways a single operating certificate. The reservation systems of the two airlines were integrated on October 17th, 2015.

5 Data

5.1 Data for the DID Analysis

For the purpose of this study, I restrict the data to the 48 U.S. contiguous states. The main source of data for this project is the DB1B database of the Department of Transportation. The database is a 10% quarterly sample of airline origins and destinations. The database has three different parts: DB1B Coupon, DB1B Market, and DB1B Ticket.

The DB1B Ticket dataset contains information about each itinerary: the sequence of airports visited, including the origin and the final destination; the number of connections each way; the ticket prices; the number of passengers; information about

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[12] https://www.justice.gov/opa/pr/justice-department-requires-us-airways-and-american-airlines-divest-facilities-seven-key.

[13] http://www.frequentbusinesstraveler.com/2013/12/supreme-court-declines-to-block-american-us-air-merger/.

the ticketing carrier and operating carrier; and the distance traveled. I adjust all prices with the use of the CPI, using 2009 as the base. I drop itineraries with fares that are unreasonably high or low (itineraries with fares above \$2000 or below \$50 are dropped).[14] I also exclude round-trip itineraries with more than one connection each way. Itineraries with multiple destinations are also excluded. These are standard steps in the literature to clean and simplify the data.

For the analysis, I combine smaller airline with the parent company. For example, American Eagle is a subsidiary of the parent company American Airlines. I treat codeshare agreements in a similar way. For simplicity, I assign the ownership of the codeshare flights to the ticketing carrier that actually sells the ticket to the consumer. I drop itineraries with multiple ticketing carriers.

I define a market as a unique year-quarter-origin-destination combination. A market is defined as a directional airport-to-airport trip in a particular year and a particular quarter: For example, in 2016 quarter 1, Indianapolis (IND) to Chicago (ORD). "Directional market" implies that air travel from Indianapolis to Chicago is a distinct market from air travel from Chicago to Indianapolis. This implies also that the characteristics of the origin airport are important factors that affect air travel demand.

The T-100 Domestic Segment database is used for flight frequency. I use the number of departures from a particular city-pair market to calculate the frequency of flights. The frequency of the data is monthly, so I aggregate the monthly number of departures to calculate the quarterly frequency. I then match this data with the DB1B database. I utilize the On-Time Performance database for quality-related variables such as delay and cancellation of flights.

I define the pre-merger period as the eight quarters before the merger was announced, from 2010Q2 to 2012Q1.[15] I specify the post-merger period as four quarters after the merger is completed: from 2016Q1 to 2016Q4. The selection of 2016Q1 as the starting of the post-merger period is reasonable since the International Air Transport Association (IATA) retired the "US" code in 2016Q1.

The summary statistics of the number of passengers and price for the pre-merger and the post-merger period are given in Tables 1 and 2. Summary statistics of the frequency of flights and the number of seats for the pre-merger period and the post-merger period are given in Tables 3 and 4. I have also reported the summary statistics of the delay and the cancellation of flights for the pre-merger period and the post-merger period in Tables 5 and 6.[16]

Table 1 lists the summary statistics of the pre-merger data for the number of passengers (in a quarter), and the passenger-weighted average price (in a quarter). There

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[14] Extremely low fares indicates that those tickets were purchased using frequent flier miles or some kind of promotion by the airlines. I also dropped the itineraries with "not credible" fares.

[15] I have done the analysis with various different pre-merger periods, and the results are qualitatively the same.

[16] Please keep in mind that the total number of observations for passengers, flight frequency, and delay are different because the data sources are different for these three types of data. Price and the number-of-passengers data are from DB1B; and flight frequency and number of seats data are from the T100 Database. The data regarding delay and cancellations come from On Time Performance Database.

Table 1 Summary statistics pre-merger period

Variable	Obs	Mean	SD	Min	Max	P25	P50	P75
Control group								
Number of passengers (per quarter)	15,552	6826.15	7781.99	490	101,710	2340	4000	8090
Passenger-weighted average price	15,552	355.27	110.42	77.89	820.85	273.82	344.28	423.4
Treatment group								
Number of passengers (per quarter)	11,100	10,699.77	12,978.22	510	107,360	2960	5890	12,890
Passenger-weighted average price	11,100	393.64	94.55	128.27	953.64	325.43	391.05	454.66

Table 2 Summary statistics post-merger period

Variable	Obs	Mean	SD	Min	Max	P25	P50	P75
Control group								
Number of passengers (per quarter)	6409	7964.58	9103.8	580	100,750	2590	4640	9720
Passenger-weighted average price	6409	353.81	106.61	85.08	816.73	279.69	336.9	421.74
Treatment group								
Number of passengers (per quarter)	5195	11,811.68	14484.01	690	110,320	3080	6270	14,120
Passenger-weighted average price	5195	397.42	99.04	145.81	817.65	320.33	399.82	468.83

Table 3 Summary statistics pre-merger period

Variable	Obs	Mean	SD	Min	Max	P25	P50	P75
Control group								
Flight frequency (per quarter)	6447	500.51	442.52	1	2620	168	377	732
Number of seats (per quarter)	6447	61,017.65	61,030.93	0	386,687	16,859	40,091	86,775
Treatment group								
Flight frequency (per quarter)	8883	603.15	556.47	1	4876	215	449	829
Number of seats (per quarter)	8883	72,822.22	75,474.01	0	588,567	20,954	47,810	101,582

are 15,552 observations in the control group (routes not operated by either AA, US, or both) and 11,100 observations in the treatment group (routes operated by either AA, US, or both). The average number of passengers that traveled in the treatment group is

Table 4 Summary statistics post-merger period

Variable	Obs	Mean	SD	Min	Max	P25	P50	P75
Control group								
Flight frequency (per quarter)	2852	449.25	438.29	1	3256	131.5	310	631
Number of seats (per quarter)	2852	61,154.01	66,003.23	0	451,669	15,550	38,194	85,774
Treatment group								
Flight frequency (per quarter)	4096	553.87	539.12	1	5712	181	412	765
Number of seats (per quarter)	4096	72,772.32	78,066.11	0	682,724	19,633	45,946	99,231.5

Table 5 Summary statistics pre-merger period

Variable	Obs	Mean	SD	Min	Max	P25	P50	P75
Control group								
Delay in arrival (minutes per quarter)	12,081	2608.73	2605.38	0	23,144	794	1804	3542
Delay in departure (minutes per quarter)	12,081	2378.28	2415.97	− 1508	22,357	690	1661	3282
Cancellation of flights (per quarter)	12,081	1.75	3.61	0	62	0	0	2
Treatment group								
Delay in arrival (minutes per quarter)	9080	3690.3	3931.46	0	48,601	1145	2470.5	4856
Delay in departure (minutes per quarter)	9080	3044.3	3401.3	− 1384	46,449	853.5	1999	4053
Cancellation of flights (per quarter)	9080	3.64	6.66	0	107	0	1	4

10,700, compared to 6826 in the control group. The average price is $394 in the treatment group, compared to $355 in the control group.

Similar summary statistics for the post-merger period are given in Table 2. There are 6409 observations in the control group and 5195 observations in the treatment group. The average number of passengers traveled in the treatment group is 11,812, compared to 7965 in the control group. The average price is $397 in the treatment group, compared to $353 in the control group.

Table 3 provides the summary statistics for the pre-merger for flight frequency (total number of departures in a quarter) and the number of seats (total number of seats in a quarter) for the non-stop markets. There are 6447 observations in the control group and 8883 observations in the treatment group. The average flight frequency (number of departures in a quarter) in the treatment group is 603, compared to 500 in the control

Table 6 Summary statistics post-merger period

Variable	Obs	Mean	SD	Min	Max	P25	P50	P75
Control group								
Delay in arrival (minutes per quarter)	5344	2639.57	2865.1	0	27,504	837	1738.5	3405
Delay in departure (minutes per quarter)	5344	2477.12	2713.03	− 896	27,142	764	1634.5	3249
Cancellation of flights	5344	1.28	3	0	70	0	0	1
Treatment group								
Delay in arrival (minutes per quarter)	4128	4150.94	4970.52	0	56,999	1129.5	2535.5	5392
Delay in departure (minutes per quarter)	4128	3680.69	4437.8	− 792	47,028	944.5	2240.5	4818.5
Cancellation of flights (per quarter)	4128	1.99	4.26	0	82	0	1	2

group. The average number of seats available is 72,822 in the treatment group, compared to 61,031 in the control group.

The summary statistics of the post-merger period are given in Table 4 for flight frequency and the number of seats for the non-stop markets. There are 2852 observations in the control group and 4096 observations in the treatment group. The average flight frequency (number of departures in a quarter) in the treatment group is 553, compared to 449 in the control group. The average number of seats available is 72,772 in the treatment group, compared to 61,154 in the control group.

Table 5 records the summary statistics of the pre-merger data for the delay in arrival, the delay in departure, and the number of cancellations. There are 12,081 observations in the control group and 9080 observations in the treatment group. The average delay in arrival (number of minutes in a quarter) in the treatment group is 3690, compared to 2608 in the control group. The average delay in departure (number of minutes in a quarter) in the treatment group is 3044, compared to 2378 in the control group. The average number of cancellations in the treatment group is 4, compared to 2 in the control group.

The summary statistics of the post-merger period are given in Table 6 for the delay in arrival, the delay in departure, and the number of cancellations. There are 5344 observations in the control group and 4128 observations in the treatment group. The average delay in arrival (number of minutes in a quarter) in the treatment group is 4151, compared to 2640 in the control group. The average delay in departure (number of minutes in a quarter) in the treatment group is 3681, compared to 2477 in the control group. The average number of cancellations in the treatment group is 2, compared to 1 in the control group.

6 Identification Strategy

I use difference-in-differences analysis to answer the main research question of this paper. To overcome the omitted variable bias, difference-in-differences analysis (DID) is particularly useful. While taking the second difference the confounding factors are dropped from both treatment and control. For DID analysis the design of the treatment and the control is important. I have done several robustness checks to make sure that the design of the treatment and of the control does not bias the results.

6.1 Difference-in-Differences Analysis (DID)

I calculate the difference in prices on routes operated by AA or US (treatment) between the post- (2016: Q1 to Q4) and the pre-merger period (2010: Q2 to 2012: Q2), and I also calculate the difference in prices on routes that were not operated by AA or US (control). I take the difference of those two. This will eliminate the effect of changes in cost and other general economic changes between the pre- and post-merger period and will give us the effect of the merger on price.[17] My estimating equation is:

$$P_{jmt} = \gamma_m * Treatment + \lambda_t * Time + \delta * D_{mt} + \epsilon_{jmt} \tag{1}$$

In Eq. (1), P_{jmt} is the price of product j in market m at time t; γ_m is the coefficient of the treatment variable; λ_t is the coefficient of the time variable; D_{mt} is time variable multiplied by the treatment variable; and ϵ_{jmt} is the error term. Under a strict exogeneity assumption of the treatment variable D_{mt}, it can be shown that the DID estimator is the following:

$$\hat{\delta} = \frac{1}{M} \sum_{m=1}^{M} \left(\bar{P}_{m1} - \bar{P}_{m2} \right) - \frac{1}{N} \sum_{n=1}^{N} \left(\bar{P}_{n1} - \bar{P}_{n2} \right),$$

where

$$
\begin{aligned}
\bar{P}_{mt} &= \sum_{j=1}^{J_m} P_{jmt} w_j \qquad \forall\, t = 1, 2 \\
\bar{P}_{nt} &= \sum_{j=1}^{J_n} P_{jnt} w_j \qquad \forall\, t = 1, 2.
\end{aligned}
\tag{2}
$$

In Eq. (2), M is the number of markets that are used as the treatment, and N is the number of markets that are used as the control. J_m is the number of products in market m. w_j is the proportion of passengers that is used as a weight to calculate the average fare in a particular market.

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[17] See Ashenfelter and Card (1985) and Card and Krueger (2000) for more details about DID analysis.
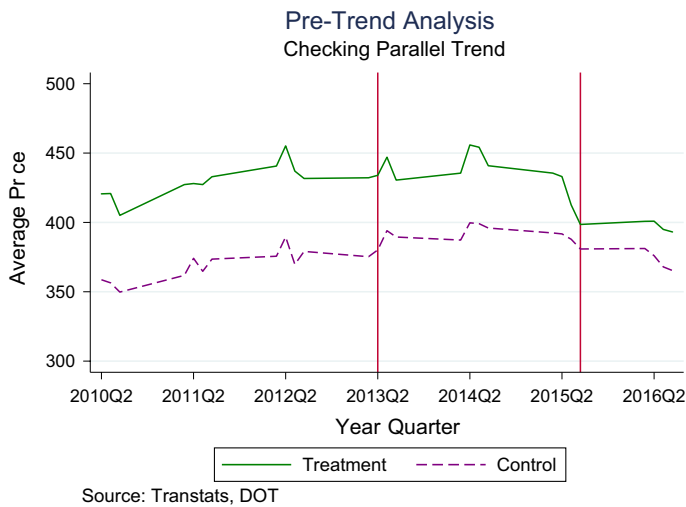
Fig. 2 Pre-trend analysis

6.1.1 Pre-trend Analysis

For DID analysis to be an appropriate methodology, it is important to check if there is a parallel price trend for the treatment and the control groups.

From Fig. 2, we can see that the pre-merger prices among the treatment and the control group are parallel, which means that the use of DID analysis to identify the effect of the merger is justified.

I have also provided the pre-trend analysis for frequency of flights and for the number of seats in Fig. 3. Figure 4 illustrates the pre-trends for variables that are related to delay, and Fig. 5 shows the pre-merger trends for cancellation of flights.

7 Results

I provide here the results from the DID analysis. In Table 7, I list the DID statistics for price for different types of markets, which are defined according to the number of passengers.[18]

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[18] I have not defined market size in terms of population of the origin and destination because it is well known that people from nearby cities may drive and fly from another city. In that case, population might not be a good indicator to define market size (Li et al. 2018). Nonetheless, I have provided the results in Table 14 in "Appendix" using population as market size, and the results are qualitatively similar. Also, I have not divided the markets by the number of competitors because number of competitors is endogenous; in one of my companion papers, Das (2018b), I show that entry and exit can happen even within a span of 2 years; so even in the short run, number of competitors is endogenous. Again, I have provided the results in Table 15 in "Appendix" using the number of competitors in the pre-merger period as the criteria to divide the markets, and the results are qualitatively similar.
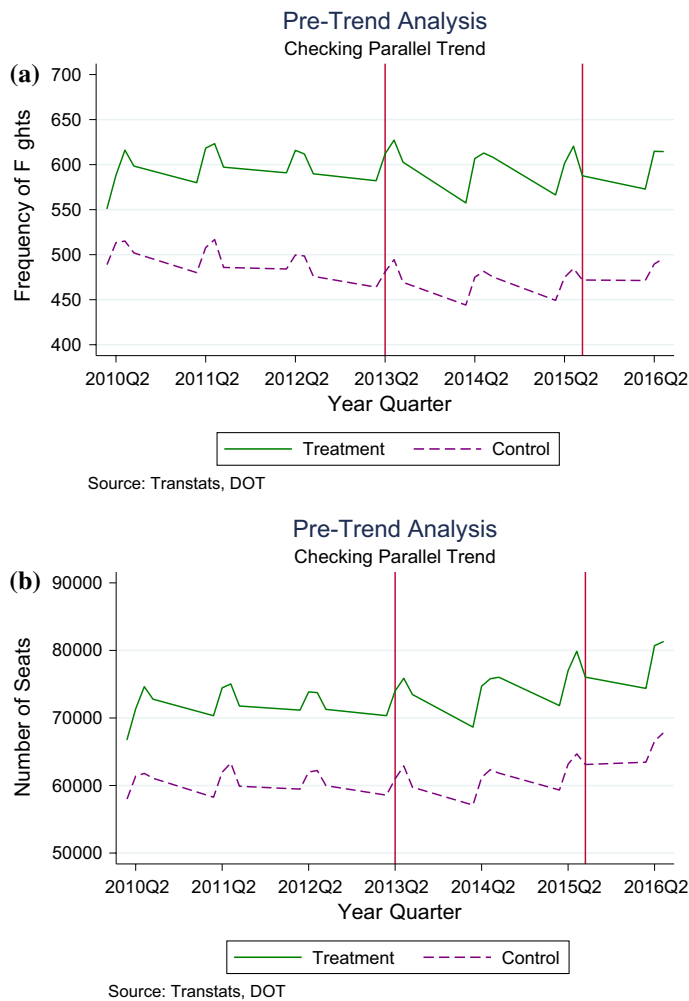
Fig. 3 Pre-trend analysis

The first column of Table 7 considers all of the markets where the number of passengers traveled is less than 5000 in a particular year and quarter. The second column considers all of the markets where the number of passengers is less than 10,000 and more than or equal to 5000 in a particular year and quarter. The third column considers all of the markets where the number of passengers is less than 25,000 and more than or equal to 10,000 in a particular year and quarter. The fourth column considers all the markets where the number of passengers is more than or equal to 25,000 in a particular year and quarter. Finally, the fifth column consists of all of the markets together for the analysis.

(a)

Pre-Trend Analysis
Checking Parallel Trend

Source: Transtats, DOT

(b)

Pre-Trend Analysis
Checking Parallel Trend

Source: Transtats, DOT
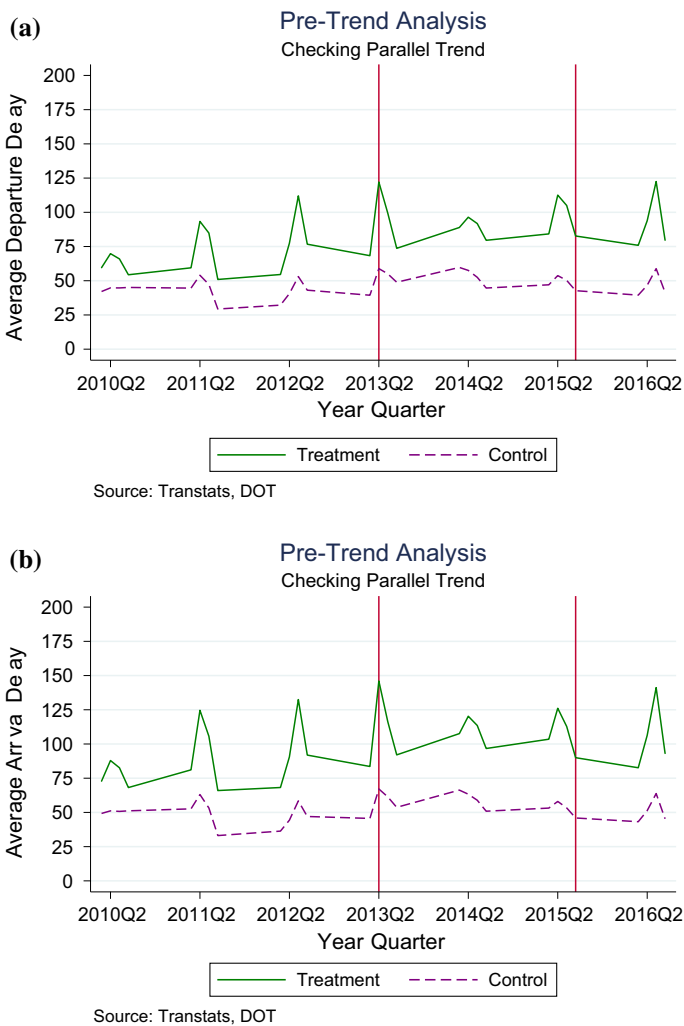
Fig. 4 Pre-trend analysis

The overall difference is around − \$9 (Table 7, column 5), while the difference is larger for bigger markets (− \$23 in column 4). On the other hand, the difference is positive for smaller markets (\$21 in column 1), which means that the price has increased in smaller markets due to the merger.[19]

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[19] For robustness purpose I have provided the results for non-stop and connecting markets separately in Tables 16, 17, and 18 in "Appendix". The nature of competition may be different in non-stop markets compared to connecting markets. I find that the results are qualitatively similar to Table 7.

Fig. 5 Pre-trend analysis

Table 8 enumerates the DID statistics for price for different types of markets with divestiture as another control variable. Divestiture is defined as a dummy variable that takes the value of one if both of the cities in a city-pair market involve the divestiture of any gates or slot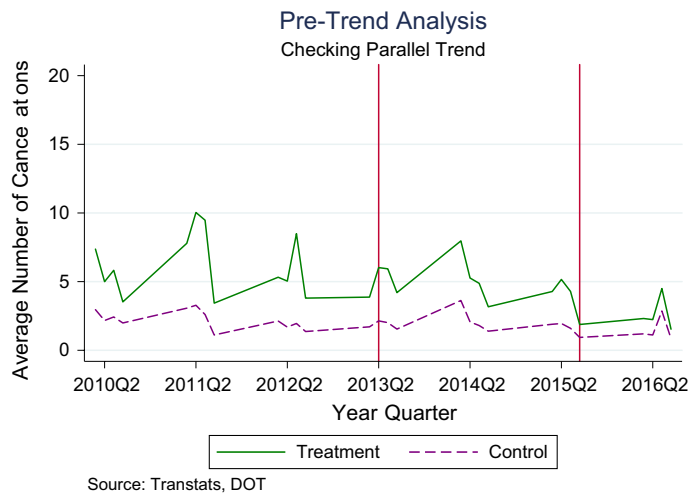s to LCCs.[20] The overall difference is around − $9.23, while the difference is larger for bigger markets. On the other hand, the difference is positive for the smaller markets which means that the price did not go down in the smaller markets due to the merger—unlike in the bigger markets.

We can also see that the divestiture has a negative significant impact on the price in both the smallest and the largest markets. Thus, the divestiture of assets to LCCs has played an effective role in reducing the price across all types of city-pair markets.[21] One important thing to notice is that the DID results are similar even after controlling for divestiture.

InTable 9, I record the DID statistics for frequency of flights for different types of markets. The overall difference is around 9, which implies more frequent flights; but the coefficient is not statistically significant. Also, the difference is positive for medium and small markets and negative for large markets; but none of the coefficients are statistically significant. The negative significant effect of the time variable in Table 9 implies that over time the frequency of flights has gone down for the control group of markets.

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[20] As a robustness check I have also defined divestiture as the number of gates sold to LCCs and I find similar results as shown in Table 19.

[21] I have done several robustness checks such as including the year-quarter fixed effects and the origin and destination fixed effects and clustering with respect to destination to control for hub effects. I have included the results in Tables 20 and 21 in "Appendix". The results are qualitatively the same and quantitatively very similar to Tables 7 and 8.

Table 7 Diff-in-diff analysis: price

	(1)	(2)	(3)	(4)	(5)
	Price	Price	Price	Price	Price
	< 5K	< 10K and ≥ 5K	< 25K and ≥ 10K	≥ 25K	All
Time	2.948 (1.26)	− 4.842 (− 1.57)	− 1.955 (− 0.67)	− 0.335 (− 0.06)	− 6.787*** (− 3.37)
Treated	38.84*** (21.17)	57.95*** (21.67)	66.36*** (24.90)	67.99*** (16.55)	45.60*** (25.35)
DID	21.46*** (6.50)	8.736* (1.88)	− 15.20*** (− 3.31)	− 23.75*** (− 3.27)	− 9.044*** (− 2.75)
Constant	372.7*** (294.08)	340.3*** (184.43)	304.5*** (182.37)	274.1*** (94.25)	322.8*** (302.44)
N	19,628	8609	7356	2663	38,256
Adj. R^2	0.048	0.084	0.106	0.102	0.047

t Statistics in parentheses, market size is defined as number of passengers per quarter

$*p < 0.10$; $**p < 0.05$; $***p < 0.01$

Table 8 Diff-in-diff analysis: divestiture

	(1)	(2)	(3)	(4)	(5)
	Price	Price	Price	Price	Price
	<5K	<10K and ≥5K	<25K and ≥10K	≥25K	All
Time	2.917 (1.25)	−4.849 (−1.58)	−1.911 (−0.65)	−0.264 (−0.05)	−6.497*** (−3.23)
Treated	38.87*** (21.19)	57.85*** (21.54)	66.41*** (24.78)	69.37*** (16.29)	47.61*** (26.15)
DID	21.45*** (6.49)	8.815* (1.89)	−15.24*** (−3.32)	−23.90*** (−3.30)	−9.227*** (−2.83)
Divest	−24.11*** (−3.48)	8.465 (1.01)	−2.187 (−0.33)	−10.60** (−2.22)	−33.20*** (−8.73)
Constant	372.7*** (293.82)	340.3*** (184.42)	304.5*** (182.36)	274.1*** (94.24)	322.9*** (302.42)
N	19,628	8609	7356	2663	38,256
Adj. R^2	0.048	0.084	0.106	0.103	0.051

t Statistics in parentheses

$*p < 0.10$; $**p < 0.05$; $***p < 0.01$

Table 9 Diff-in-diff analysis: frequency of flights

	(1)	(2)	(3)	(4)	(5)
	Freq	Freq	Freq	Freq	Freq
	< 5K	< 10K and ≥ 5K	< 25K and ≥ 10K	≥ 25K	All
Time	− 133.9*** (− 9.56)	− 222.1*** (− 9.58)	− 362.5*** (− 12.07)	− 518.8*** (− 10.32)	− 270.1*** (− 13.25)
Treated	8.851 (0.47)	− 40.52 (− 1.21)	− 63.35* (− 1.94)	− 40.20 (− 0.25)	− 66.49** (− 2.18)
DID	4.170 (0.31)	25.10 (1.29)	40.48 (1.53)	− 77.60 (− 1.47)	8.755 (0.55)
Constant	54.63 (0.68)	957.8*** (8.32)	885.1*** (9.52)	356.1** (2.67)	− 474.8*** (− 6.67)
Year-quarter FE	Y	Y	Y	Y	Y
Origin FE	Y	Y	Y	Y	Y
Destination FE	Y	Y	Y	Y	Y
Cluster	Y	Y	Y	Y	Y
N	9446	7440	7633	2976	27495
Adj. R^2	0.621	0.630	0.629	0.568	0.489

t statistics in parentheses

*$p < 0.10$; **$p < 0.05$; ***$p < 0.01$

Table 10 Diff-in-diff analysis: number of seats

	(1)	(2)	(3)	(4)	(5)
	Seat	Seat	Seat	Seat	Seat
	< 5K	< 10K and ≥ 5K	< 25K and ≥ 10K	≥ 25K	All
Time	− 10174.0*** (− 7.42)	− 21420.9*** (− 9.38)	− 39376.3*** (− 13.54)	− 68253.3*** (− 11.14)	− 28754.3*** (− 13.37)
Treated	− 1319.3 (− 0.70)	− 6385.8* (− 1.74)	− 10430.3*** (− 2.66)	− 15453.5 (− 0.73)	− 10098.2** (− 2.38)
DID	1596.8 (1.49)	2418.3 (1.34)	2043.5 (0.79)	− 6816.6 (− 1.10)	886.2 (0.64)
Constant	− 14622.7** (− 2.26)	61354.8*** (5.23)	46999.0*** (3.37)	49090.1*** (3.06)	− 103283.4*** (− 13.61)
Year-quarter FE	Y	Y	Y	Y	Y
Origin FE	Y	Y	Y	Y	Y
Destination FE	Y	Y	Y	Y	Y
Cluster	Y	Y	Y	Y	Y
N	9446	7440	7633	2976	27495
Adj. R^2	0.609	0.672	0.680	0.629	0.551

t Statistics in parentheses

*$p < 0.10$; **$p < 0.05$; ***$p < 0.01$

Table 11 Diff-in-diff analysis: delay in departure

	(1)	(2)	(3)	(4)	(5)
	DD	DD	DD	DD	DD
	< 5K	< 10K and ≥ 5K	< 25K and ≥ 10K	≥ 25K	All
Time	− 329.2*** (− 4.00)	− 571.6*** (− 4.67)	− 228.8 (− 1.15)	369.7 (0.73)	− 346.0* (− 1.80)
Treated	− 314.3** (− 2.30)	− 347.8** (− 2.07)	− 942.4*** (− 4.58)	− 992.5 (− 1.07)	− 1349.5*** (− 4.48)
DID	95.73 (0.73)	471.8*** (2.72)	687.2*** (3.28)	1532.7** (2.44)	1333.2*** (4.81)
Constant	4182.6*** (5.94)	2155.0*** (5.96)	6548.3*** (8.25)	1287.9 (1.22)	− 2301.3*** (− 4.41)
Year-quarter FE	Y	Y	Y	Y	Y
Origin FE	Y	Y	Y	Y	Y
Destination FE	Y	Y	Y	Y	Y
Cluster	Y	Y	Y	Y	Y
N	12,556	8154	7376	2547	30,633
Adj. R^2	0.366	0.427	0.432	0.504	0.464

t statistics in parentheses

*$p < 0.10$; **$p < 0.05$; ***$p < 0.01$

Table 12 Diff-in-diff analysis: delay in arrival

	(1)	(2)	(3)	(4)	(5)
	DA	DA	DA	DA	DA
	< 5K	< 10K and ≥ 5K	< 25K and ≥ 10K	≥ 25K	All
Time	− 479.0*** (− 5.88)	− 748.0*** (− 5.88)	− 472.7** (− 2.49)	411.2 (0.63)	− 498.6** (− 2.30)
Treated	− 264.1* (− 1.77)	− 346.1* (− 1.95)	− 1065.8*** (− 4.72)	− 983.2 (− 0.90)	− 1406.8*** (− 4.38)
DID	18.49 (0.13)	365.1* (1.83)	627.1*** (3.56)	1417.4* (1.91)	1272.9*** (3.82)
Constant	4806.0*** (5.15)	2640.4*** (6.83)	6759.3*** (8.53)	800.3 (0.72)	− 3449.6*** (− 3.64)
Year-quarter FE	Y	Y	Y	Y	Y
Origin FE	Y	Y	Y	Y	Y
Destination FE	Y	Y	Y	Y	Y
Cluster	Y	Y	Y	Y	Y
N	12,556	8154	7376	2547	30,633
Adj. R^2	0.392	0.445	0.459	0.508	0.493

t Statistics in parentheses

*$p < 0.10$; **$p < 0.05$; ***$p < 0.01$

Table 10, provides the DID statistics for the number of seats that were available for different types of markets. The overall difference is around 886.2, but it is not statistically significant. Although the difference is positive for the small and the medium sized markets and negative for large markets, neither of those coefficients are statistically significant.

In Table 11, I list the DID statistics for the delay in departure (total minutes of delay in a quarter in a city-pair market) for different types of markets. The overall difference is around 1333, and it is statistically significant. The result implies that the number of minutes of delay increased as a result of the merger by approximately 1333 min per quarter, or by 15 min per day. The difference is positive for small, medium, and large markets and is statistically significant for all types of markets except small markets.

The delay in markets where the number of passengers is between 5000 to 10,000 in a quarter has increased by approximately 471 min per quarter, or 5 min per day. On the other hand, the delay in markets where the number of passengers is more than 25,000 in a quarter has increased by approximately 1532 min per quarter, or 17 min per day.

In Table 12, I record the DID statistics for the delay in arrival (total minutes of delay in a quarter in a city-pair market) for different types of markets. The overall difference is around 1272, and it is statistically significant. The result implies that the minutes of delay has increased as a result of the merger by approximately 1272 min per quarter, or by 14 min per day. The difference is positive for small, medium, and large markets and is statistically significant for all types of markets except the small markets. The delay in markets where the number of passengers is between 5000 to 10,000 in a quarter has increased by approximately 365 min per quarter, or 4 min per day. On the other hand, delay in markets where the number of passengers is more than 25,000 in a quarter has increased by approximately 1417 min per quarter, or 16 min per day.

Table 13 lists the DID statistics for number of cancellations per quarter for different types of markets. The overall difference is around -2, and it is statistically significant. On the other hand, the difference is bigger for the larger markets. The difference is statistically significant for all types of markets. Thus the merger has reduced cancellations in affected markets.

8 Conclusion

This paper analyzes the impact of the AA-US merger on market price and product quality. From the difference-in-differences analysis I find that the merger had a significant negative effect on the price in the larger markets. Smaller markets have not benefited from the merger in terms of lower price: Price has increased in the smaller markets due to the merger. Slot divestiture has helped to reduce the price in both larger and smaller markets. However the negative effect of slot divestiture on price in smaller markets is greater, which is consistent with the idea that competition is diminished in many smaller markets. Slot divestiture helps in increasing the level of competition, which results in lower prices.

Table 13 Diff-in-diff analysis: cancellation of flights

	(1)	(2)	(3)	(4)	(5)
	NoC	NoC	NoC	NoC	NoC
	< 5K	< 10K and ≥ 5K	< 25K and ≥ 10K	≥ 25K	All
Time	− 1.082*** (− 6.00)	− 1.165*** (− 4.19)	− 1.751*** (− 5.17)	− 4.172*** (− 3.30)	− 2.495*** (− 5.56)
Treated	0.454** (2.17)	0.0576 (0.33)	− 0.408 (− 0.63)	1.385 (0.83)	− 0.602* (− 1.70)
DID	− 0.614** (− 2.22)	− 0.423* (− 1.81)	− 0.881*** (− 2.78)	− 4.963*** (− 3.21)	− 2.427*** (− 3.41)
Constant	7.331*** (4.21)	2.552*** (3.85)	0.465 (0.18)	2.795* (1.81)	− 2.247 (− 1.04)
Year-quarter FE	Y	Y	Y	Y	Y
Origin FE	Y	Y	Y	Y	Y
Destination FE	Y	Y	Y	Y	Y
Cluster	Y	Y	Y	Y	Y
N	12,556	8154	7376	2547	30,633
Adj. R^2	0.230	0.252	0.309	0.387	0.321

t Statistics in parentheses

*$p < 0.10$; **$p < 0.05$; ***$p < 0.01$

I also find that the merger had no significant effect on the frequency of flights or capacity (number of seats) in the nonstop markets. Delay in departure and arrival have increased as a result of the merger, but the merger had significant effects in reducing the number of cancellations in the post-merger period.

From the difference-in-differences analysis, the evidence indicates that the merger between American and US Airways has been beneficial to consumers in terms lower average prices and fewer number of canceled flights in the larger markets, while the smaller markets have not benefited from lower prices. The fact that divestiture has a significant impact in reducing the price in smaller markets has important policy implications. To keep smaller markets more competitive and prices at the competitive level, divestiture is an important policy tool.

Some limitations need to be acknowledged: First, my analysis does not incorporate the intertemporal pricing decisions of the airlines. Second, the DOT data are quarterly data, which might raise the issue of aggregation bias.

Appendix

Figure 6 shows the route network of American Airlines in the pre-merger period. American Airlines had 6 hub airports which were Chicago Ohare, New York LaGuardia, Washington DC, Miami International, Dallas Forth Worth, and Los Angles International.

Figure 7 shows the route network of US Airways in the pre-merger period. US Airways had 4 hub airports which were Boston Logan, Philadelphia, Charlotte, and Phoenix. Figure 8 shows the overlapping route network of US Airways and American Airline in the pre-merger period.
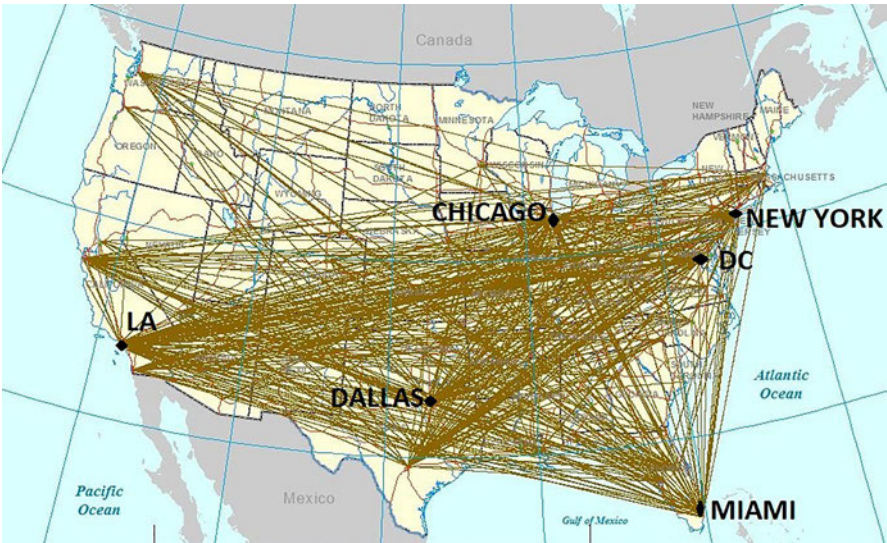
Fig. 6 Route network of American Airlines in the pre-merger period
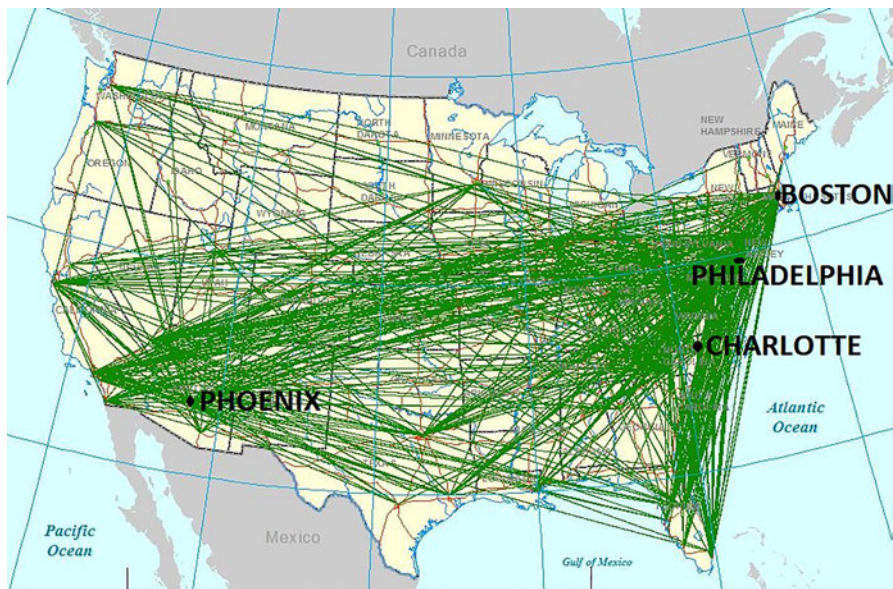
Fig. 7 Route network of US Airlines in the pre-merger period

Fig. 8 Overlapping route network of American Airlines and US Airlines in the pre-merger period

Table 14 provides the DID analysis results for price with market size defined according to the population in the origin and the destination. The results are qualitatively similar to the DID results for price shown in the paper which implies the robustness of the results shown in the paper.

Table 14 Diff-in-diff analysis: price with population as market size

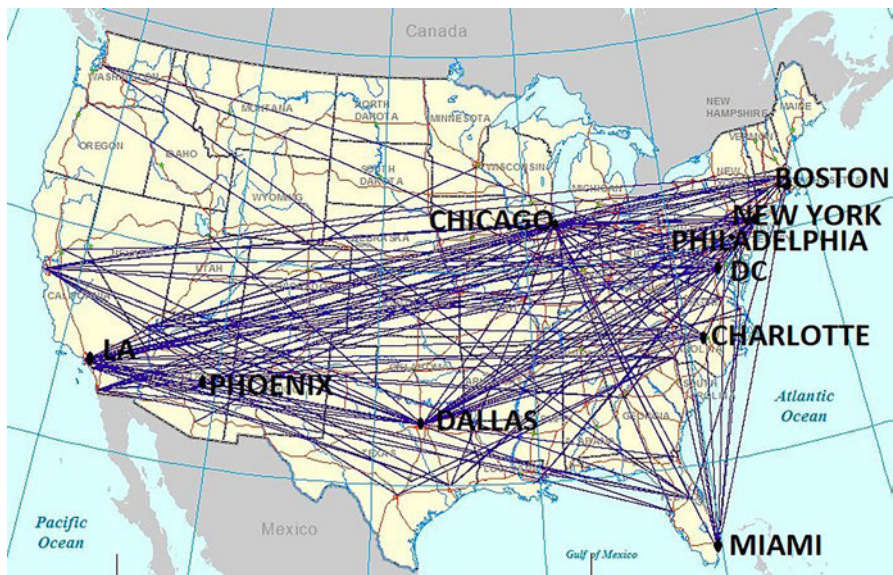|	(1) Price ≤.75M	(2) Price ≤1.5M and >.75M	(3) Price ≤2M and >1.5M	(4) Price >2M	(5) Price All
Time	− 34.95** (− 2.63)	22.77*** (2.97)	18.19* (1.96)	− 16.83*** (− 4.11)	− 11.01*** (− 2.62)
Treated	− 8.772 (− 1.05)	25.54** (2.37)	35.03*** (3.67)	33.25*** (4.17)	34.94*** (5.15)
DID	25.32** (2.21)	15.13* (1.68)	− 0.849 (− 0.13)	− 2.382 (− 0.37)	− 5.216 (− 0.81)
Constant	192.5*** (32.94)	325.0*** (4.46)	308.1*** (8.55)	747.1*** (24.44)	677.3*** (12.88)
Year-quarter FE	Y	Y	Y	Y	Y
Origin FE	Y	Y	Y	Y	Y
Destination FE	Y	Y	Y	Y	Y
Cluster	Y	Y	Y	Y	Y
N	176	2950	4420	30,522	38,068
Adj. R^2	0.883	0.648	0.357	0.319	0.319

t Statistics in parentheses, M represents million

*$p < 0.10$; **$p < 0.05$; ***$p < 0.01$

Table 15 Diff-in-diff analysis: price; separating the markets with pre-merger number of competitors

	(1) Price < 2	(2) Price < 3 and ≥ 2	(3) Price < 4 and ≥ 3	(4) Price ≥ 4	(5) Price All
Time	− 11.75*** (− 2.85)	− 13.58*** (− 2.80)	− 9.272 (− 1.18)	− 14.87 (− 1.53)	− 10.95** (− 2.60)
Treated	26.96*** (2.69)	25.83*** (4.03)	34.68*** (3.66)	9.136 (0.78)	34.90*** (5.15)
DID	16.05* (1.77)	3.198 (0.38)	− 17.04 (− 1.61)	− 4.857 (− 0.49)	− 5.189 (− 0.81)
Constant	598.0*** (12.17)	643.1*** (10.58)	213.8*** (7.38)	250.1*** (14.69)	489.1*** (97.07)
Year-quarter FE	Y	Y	Y	Y	Y
Origin FE	Y	Y	Y	Y	Y
Destination FE	Y	Y	Y	Y	Y
Cluster	Y	Y	Y	Y	Y
N	11,584	12,339	6636	4591	38,256
Adj. R^2	0.537	0.448	0.439	0.393	0.323

t Statistics in parentheses

$*p < 0.10$; $**p < 0.05$; $***p < 0.01$

Table 16 Diff-in-diff analysis: price (markets with only nonstop product competition)

	(1) price	(2) Price	(3) Price	(4) Price	(5) Price
	< 5K	< 10K and ≥ 5K	< 25K and ≥ 10K	≥ 25K	All
Time	− 7.485 (− 0.88)	0.664 (0.09)	− 3.315 (− 0.60)	0.536 (0.08)	− 8.962* (− 1.94)
Treated	30.60** (2.16)	− 7.555 (− 0.57)	− 22.07* (− 1.97)	5.286 (0.67)	− 10.79 (− 1.41)
DID	1.925 (0.18)	− 11.79 (− 0.85)	− 15.55 (− 1.06)	− 28.08 (− 1.35)	− 17.02* (− 1.76)
Constant	431.5*** (19.77)	204.1*** (10.19)	324.8*** (10.93)	118.9*** (7.10)	524.0*** (61.68)
Year-quarter FE	Y	Y	Y	Y	Y
Origin FE	Y	Y	Y	Y	Y
Destination FE	Y	Y	Y	Y	Y
Cluster	Y	Y	Y	Y	Y
N	5050	1956	1630	429	9065
Adj. R^2	0.680	0.700	0.626	0.740	0.568

t Statistics in parentheses

*$p < 0.10$; **$p < 0.05$; ***$p < 0.01$

Table 16 provides the DID analysis results for price with markets with only nonstop product competition. The results are different compared to the results in Table 7. In Table 16, even though the DID statistic for all markets together is negative and statistically significant, the DID statistics for other columns are not statistically significant. In spite of the difference in statistical significance, the sign and the magnitude of the DID statistics are in line with Table 7. In Table 16 the DID statistics for the larger markets are negative which is similar to Table 7.

Table 17 provides the DID analysis results for price for markets having both nonstop and connecting products. The results are different compared to the DID results for price in Tables 7 and 16. In Table 17, the DID statistics for the smaller markets are positive and statistically significant as Table 7, but for the larger markets the DID statistic is not statistically significant.

Table 18 provides the DID analysis results for price for markets with only connecting product competition. The smallest markets have only connecting products and no nonstop products. As a result, in Table 18, I have only reported the statistics for the first column. The sample size is too small to calculate the coefficients for the other markets. The results in Table 18 for the smaller markets are similar to Tables 7 and 17. The DID statistic for the smaller markets is positive and significant. By breaking down the results from Table 7 into only nonstop, both connecting and

Table 17 Diff-in-diff analysis: price (markets with both connecting and nonstop product competition)

	(1) Price <5K	(2) Price <10K and ≥5K	(3) Price <25K and ≥10K	(4) Price ≥25K	(5) Price All
Time	−3.774 (−0.70)	−3.670 (−0.74)	−12.88* (−1.87)	−16.26 (−1.40)	−22.33*** (−4.22)
Treated	7.962* (1.92)	18.88*** (3.18)	16.98*** (3.24)	15.06 (1.42)	17.35** (2.42)
DID	20.78*** (3.42)	16.90** (2.31)	3.170 (0.33)	−8.038 (−0.80)	1.633 (0.23)
Constant	432.6*** (7.09)	−25.66* (−1.71)	23.44** (2.23)	284.5*** (18.11)	589.8*** (8.93)
Year-quarter FE	Y	Y	Y	Y	Y
Origin FE	Y	Y	Y	Y	Y
Destination FE	Y	Y	Y	Y	Y
Cluster	Y	Y	Y	Y	Y
N	10374	6548	5724	2234	24880
Adj. R^2	0.583	0.586	0.562	0.479	0.346

t Statistics in parentheses

*$p < 0.10$; **$p < 0.05$; ***$p < 0.01$

Table 18 Diff-in-diff analysis: price (markets with only connecting product competition)

	(1) Price < 5K	(2) Price < 10K and ≥ 5K	(3) Price < 25K and ≥ 10K	(4) Price ≥ 25K	(5) Price All
Time	47.48*** (8.74)				
Treated	− 4.894 (− 1.32)				
DID	20.70*** (3.50)				
Constant	613.9*** (63.06)				
Year-quarter FE	Y				
Origin FE	Y				
Destination FE	Y				
Cluster	Y				
N	4204				
Adj. R^2	0.578				

t Statistics in parentheses

*$p < 0.10$; **$p < 0.05$; ***$p < 0.01$

nonstop, and only connecting product markets it is evident that the increase in price in the smaller markets is mostly coming from the connecting product competition and on the other hand, the negative effect on price in the larger city pair markets is coming mostly from competition in nonstop products.

Table 19 provides the DID analysis results for price with divestiture with fixed effect and clustering. Divestiture has been defined as a dummy variable as the number of gates divested.

Table 20 provides the DID analysis results for price with cluster and fixed effect.

Table 21 provides the DID analysis results for price with divestiture with fixed effect and clustering.

Table 19 Diff-in-diff analysis: price (divestiture as number of gates)

	(1) Price	(2) Price	(3) Price	(4) Price	(5) Price
	< 5K	< 10K and ≥ 5K	< 25K and ≥ 10K	≥ 25K	All
Time	3.244 (1.39)	− 5.057* (− 1.65)	− 2.040 (− 0.70)	− 0.801 (− 0.15)	− 6.715*** (− 3.34)
Treated	39.29*** (21.11)	57.71*** (21.34)	65.95*** (24.69)	70.27*** (16.65)	46.77*** (25.75)
DID	21.07*** (6.38)	8.334* (1.79)	− 15.49*** (− 3.37)	− 23.53*** (− 3.25)	− 9.202*** (− 2.81)
Divest1	− 7.830* (− 1.82)	− 15.03** (− 2.25)	− 10.56 (− 1.58)	30.01*** (4.74)	− 1.903 (− 0.48)
Divest2	− 36.47*** (− 6.09)	− 39.60*** (− 4.62)	− 11.18 (− 1.31)	16.81** (2.25)	− 23.73*** (− 4.76)
Constant	380.8*** (85.25)	355.7*** (51.47)	315.0*** (45.90)	245.0*** (34.94)	325.3*** (80.67)
N	19,628	8609	7356	2663	38,256
Adj. R^2	0.050	0.086	0.106	0.107	0.050

t Statistics in parentheses

Divest1 = 1 if number of gates divested is equal to 2, Divest2=1 if number of gates divested is equal to 34

$*p < 0.10; **p < 0.05; ***p < 0.01$

Table 20 Diff-in-diff analysis: price

	(1) Price	(2) Price	(3) Price	(4) Price	(5) Price
	< 5K	< 10K and ≥ 5K	< 25K and ≥ 10K	≥ 25K	All
Time	− 0.417 (− 0.08)	0.0256 (0.01)	− 4.619 (− 0.88)	− 4.344 (− 0.42)	− 10.95** (− 2.60)
Treated	14.62*** (3.67)	22.97*** (3.65)	28.46*** (4.83)	28.43** (2.56)	34.90*** (5.15)
DID	24.48*** (4.38)	15.12** (2.10)	− 3.566 (− 0.38)	− 19.25** (− 2.10)	− 5.189 (− 0.81)
Constant	279.1*** (25.14)	105.9*** (7.25)	29.47** (2.32)	181.0*** (12.83)	489.1*** (97.07)
Year-quarter FE	Y	Y	Y	Y	Y
Origin FE	Y	Y	Y	Y	Y
Destination FE	Y	Y	Y	Y	Y
Cluster	Y	Y	Y	Y	Y
N	19628	8609	7356	2663	38256
Adj. R^2	0.565	0.578	0.529	0.475	0.323

t Statistics in parentheses

*$p < 0.10$; **$p < 0.05$; ***$p < 0.01$

Table 21 Diff-in-diff analysis: price (divestiture)

	(1) Price < 5K	(2) Price < 10K and ≥ 5K	(3) Price < 25K and ≥ 10K	(4) Price ≥ 25K	(5) Price All
Time	− 0.532 (− 0.11)	0.100 (0.02)	− 4.635 (− 0.88)	− 4.158 (− 0.41)	− 10.88** (− 2.60)
Treated	14.41*** (3.63)	22.94*** (3.65)	28.64*** (4.88)	27.96** (2.52)	34.36*** (5.11)
DID	24.54*** (4.40)	14.81** (2.05)	− 3.454 (− 0.36)	− 19.55** (− 2.10)	− 5.347 (− 0.83)
Divestiture	− 71.64*** (− 6.34)	− 28.54 (− 1.44)	8.843 (0.54)	− 8.359 (− 0.35)	− 12.77 (− 0.75)
Constant	277.3*** (25.01)	105.4*** (7.20)	29.96** (2.35)	181.5*** (12.37)	488.2*** (90.68)
Year-quarter FE	Y	Y	Y	Y	Y
Origin FE	Y	Y	Y	Y	Y
Destination FE	Y	Y	Y	Y	Y
Cluster	Y	Y	Y	Y	Y
N	19,628	8609	7356	2663	38,256
Adj. R^2	0.566	0.578	0.529	0.475	0.323

t Statistics in parentheses

*$p < 0.10$; **$p < 0.05$; ***$p < 0.01$

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